

**Initial Comments on
US EPA 40 CFR Part 131
Water Quality Standards for the State of California
as Proposed on Tuesday, August 5, 1997**

Submitted by

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Overall Comments

The California Toxics Rule (CTR), as proposed, is significantly deficient in providing an economic analysis that includes information on the cost, and an assessment of the water quality benefits, of ultimately having to meet state water quality standards based on CTR proposed criteria in the receiving waters for urban area and highway stormwater runoff. Without this information, the public, regulatory agencies and the regulated community cannot understand the significant technical deficiencies that exist in the US EPA CTR proposed rulemaking. The CTR should not be finalized until this information has been developed and provided to the public for review and comment. Urban stormwater discharge representative-speaker after speaker at the September 17, 1997 hearing on the proposed CTR was justifiably concerned about the confusing situation that exists today; they are being informed by the US EPA that NPDES-permitted urban stormwater runoff will be subject to meeting water quality standards (objectives) in the receiving waters for the stormwater runoff during the time of runoff and after through a process of ever-increasingly stringent and expensive BMPs.

As I testified at the September 17, 1997 hearing, it is well-understood in the stormwater runoff water quality management field that the US EPA "Gold Book" water quality criteria, including those being promulgated under the California Toxics Rule, are not designed to address short-term, episodic discharges of chemical constituents of the type that routinely occur in stormwater runoff from urban areas and highways. As a result, "administrative" exceedances of the proposed California Toxics Rule criteria can readily occur without any real impairment of the designated beneficial uses of the receiving waters for the stormwater runoff. By real impairment of aquatic life-related beneficial uses I mean alteration of the number, types and/or characteristics of desirable forms of aquatic life in the receiving waters for the runoff, that are of concern to the public who must ultimately pay for the control of chemical constituents in the stormwater runoff.

There has been a sufficient number of studies conducted on the characteristics of urban and highway stormwater runoff to document that it will indeed be rare that the constituents present in urban stormwater runoff from residential and commercial areas are in toxic, available forms for a sufficient duration and magnitude in the receiving waters for the runoff to be adverse to aquatic life. As long as the US EPA persists with its improperly developed and adopted Independent Applicability Policy (by which chemical criteria/standards have to be met even if appropriately conducted studies show that the constituents of concern, such as heavy metals in urban stormwater runoff, are in non-toxic, unavailable forms) urban stormwater runoff water quality managers face ultimately having to spend large amounts of public funds to avoid "administrative" exceedances of inappropriate criteria/standards for urban stormwater runoff, with no expected improvement in the real beneficial uses of the waterbodies that are of concern to the public who must ultimately pay for the control programs.

Problems with "administrative" exceedances arise from what are well-known to be technically invalid and inappropriate approaches adopted by the US EPA in the 1980s for implementing the "Gold Book" criteria, that the Agency under various administrations has yet to address. These issues are discussed in the attached papers and in references provided therein. Even today, based on discussions at the US EPA's Multi-Regional Water Quality Criteria and Standards meeting that was held at the end of August 1997 in St. Louis, Missouri, the Agency is still unwilling to address in a meaningful way the problems in regulating urban stormwater runoff water quality. For the Agency to announce, as it did at that meeting, that wet-weather water quality management issues are no longer part of the ANPRM for water quality standards, represents a serious deficiency in the Agency's current policy that must be corrected if the public is to be protected from wasting large amounts of funds constructing structural BMPs to work toward achieving CTR-based water quality standards in the receiving/discharge waters for urban stormwater runoff.

As was pointed out by several speakers at the CTR hearing held on September 17, 1997, the US EPA Region 9 and US EPA headquarters made a significant error in developing the California Toxics Rule where those responsible chose to ignore the massive costs that regulated urban stormwater dischargers will ultimately have to bear as part of implementing the California Toxics Rule. I believe that if this matter were taken to the courts, the urban dischargers could force US EPA Region 9/Washington, D.C. to do a proper economic analysis of the cost of ultimately having to achieve water quality standards (objectives) based on CTR criteria. The fact that there is some ill-defined period of time during which the standards/criteria can be met through BMPs does not change the ultimate cost that will have to be borne by the public. It is my assessment that these costs will be on the order of at least \$1 to \$2 per person per day forever for the regulated communities.

Several of the urban stormwater dischargers who testified at the September 17, 1997 hearing reported that their preliminary cost estimates were even greater than those that I projected since not only would they have to construct and operate large treatment works to capture, store and treat urban stormwater runoff so that no more than one exceedance of a criterion/standard occurs every three years, but also they would have to acquire land near waterbodies where such treatment works could be developed. Representatives of Alameda County estimated that more than 50 facilities each the

size of the Oakland Coliseum would have to be constructed to store the stormwater runoff from a two-inch, one-day storm. The construction of such facilities in nearshore areas of Alameda County on San Francisco Bay might be justified if there were reason to believe that they would solve real, significant water quality use-impairments of San Francisco Bay occurring due to urban stormwater runoff-derived constituents that exceed proposed CTR criteria for protection of aquatic life. However, the fact is that after extensive study, none of the heavy metals in Bay Area urban stormwater discharges has been found to be in toxic, available forms that are causing real water quality use-impairments. Basically, the expenditures of dollars per person per day for the regulated community-dwellers that are now dictated by the Clean Water Act and the US EPA's Independent Applicability Policy arise from the US EPA's failing to address the obvious, significant problems with the application of the "Gold Book" and now proposed CTR criteria to urban stormwater runoff-associated constituents.

I have found that the urban stormwater runoff water quality managers are not claiming that there are no water quality problems associated with their stormwater discharges. It appears that there may be real water quality problems in urban stormwater discharges due to chemicals such as the organophosphate pesticides (e.g., diazinon and chlorpyrifos) for which the US EPA has either failed to develop a criterion (diazinon) or has failed to implement an existing criterion (chlorpyrifos). I understand that finally, after years of delay during which it has been well-known by the US EPA that diazinon was causing widespread aquatic life toxicity, the Agency is now beginning again to formulate a water quality criterion for this chemical. Additional summary information on the organophosphate pesticide issue is presented in the attached paper, *"Diazinon and Chlorpyrifos as Urban Stormwater Runoff Associated Pollutants,"* June (1997)

It is important to understand that the development of criteria for chemicals such as diazinon does not mean that those criteria will be properly implemented or enforced. The chlorpyrifos situation is an example; chlorpyrifos has been well-known to cause aquatic life toxicity in many communities' stormwater runoff, yet the Agency, including US EPA Region 9, has failed to admit publicly that there is a problem, much less act to control the toxicity problem. Under the current regulatory approach, stormwater dischargers could be required under CTR to spend massive amounts of public funds building "50 Oakland Coliseums" just to store stormwater runoff in Alameda County from a storm magnitude that occurs more frequently than once in three years because of administrative exceedances of several CTR-regulated heavy metals in the stormwater runoff (which have been repeatedly found to be in non-toxic, unavailable forms, including the dissolved forms), while the treated stormwater discharge to San Francisco Bay could be highly toxic due to unregulated or inadequately regulated organophosphate pesticides. This is an artifact of the inappropriate approaches used by the Agency of focusing on chemicals rather than chemical impacts, i.e., on potential toxicants rather than toxicity. While this approach is bureaucratically simple to administer, it is technically invalid and can lead to a massive waste of public funds in implementing stormwater runoff water quality management programs.

Urban stormwater runoff water quality management is in chaos. This situation has been well-understood for at least five years. While attempts are being made to address these issues through the

US EPA headquarters' various wet-weather committees, thus far the fundamental issue that was raised at the September 17, 1997 hearing by urban stormwater discharger after discharger, i.e., ultimately having to achieve water quality standards based on CTR criteria in the receiving waters for the discharge through ever-increasingly stringent BMPs, has not been adequately addressed. While the proposed CTR does not specify a time period over which the BMP ratcheting-down process will occur, there can be no doubt that that time period will be set by the courts through litigation brought by environmental groups who will assert that an NPDES-permitted stormwater discharger is not making adequate progress toward achieving the ultimate goal of only one violation of a water quality standard every three years for regulated constituents. Because of the uncertainty of how the courts will handle this matter, stormwater dischargers could be faced with having to achieve water quality standards in the discharge waters within five to ten years. Clearly there is need now to understand the costs and true water quality benefits associated with achieving these standards as part of adopting the CTR as it is applied to regulating urban stormwater runoff water quality.

I have published extensively on these issues. Many of my papers and reports on this topic are available from my web site (<http://members.aol.com/gfredlee/gfl.htm>).

It is my recommendation that US EPA Region 9 and US EPA headquarters postpone any adoption of the California Toxics Rule until the US EPA properly presents and discusses the potential costs and the potential water quality benefits in terms of real improvements in designated beneficial uses of receiving waters that will likely accrue as the result of regulated urban stormwater discharges' ultimately having to comply with water quality standards based on CTR criteria. The US EPA Region 9 should allow the stormwater dischargers the opportunity to provide information on the costs and benefits arising from applying these criteria to stormwater discharges as required by the Clean Water Act when it becomes clear that BMPs of the type that are readily available today will not eliminate the administrative exceedances of water quality standards numerically equal to the aquatic life criteria set forth in the CTR. After allowing the urban stormwater dischargers to provide this information, the US EPA then should develop an economic analysis that reliably presents and discusses these issues. This CTR review process is the necessary first step to correcting the significant chaos that now exists in the urban stormwater runoff water quality management field.

While I do not know how long it would take the US EPA to conduct the required analyses of the urban stormwater runoff costs and real water quality benefits, it would seem appropriate that taking a few months to accomplish this could, in the long term, represent a time and resource savings in terms of ultimately correcting the significant technical problems that exist today in regulating urban stormwater runoff. I recommend the following:

- Urban stormwater dischargers as well as other interested parties should be provided a several-month period during which a preliminary assessment of the potential costs and water quality benefits associated with having to meet CTR criteria as standards in the receiving waters for stormwater runoff of concern to the discharger, is conducted and reported to US EPA Region 9.
- The US EPA should take several months to develop an amended draft CTR that provides a

reliable economic analysis of costs and potential benefits covering the current regulatory approach for regulating chemical constituents urban stormwater runoff which involves a ratcheting down of BMPs to achieve the ultimate goal of only one exceedance of a water quality standard every three years in the receiving waters for stormwater runoff.

- The public should be given a two-month period during which to review and comment on the adequacy of the US EPA's economic analysis of costs and benefits of achieving the currently mandated goal of using CTR criteria as standards for receiving waters for regulated urban stormwater runoff.

Adoption of this approach will send a clear signal to the public that the US EPA is finally willing to meaningfully address the heart of the urban wet-weather runoff water quality management problem. With the Agency's, for the first time, reliably developing information on costs and true water quality benefits, the public, Congress, regulators and the regulated will begin to understand the need to change how urban and highway stormwater runoff is regulated to protect the designated beneficial uses of waterbodies without significant unnecessary expenditures for chemical constituent control.

Additional Comments

Presented below are some specific comments on statements made in the proposed CTR Federal Register.

Page 42160, third column, near the bottom, municipal stormwater dischargers should be added to the list of NPDES dischargers who have an interest in this rule. If anything, they probably will be affected more than any other entity.

Page 42161, third column, first paragraph, states,

"Numeric criteria for toxic pollutants allow the State and EPA to evaluate the adequacy of existing and potential control measures to protect aquatic ecosystems and human health. Numeric criteria also provide a more precise basis for deriving water quality-based effluent limitations in National Pollutant Discharge Elimination System (NPDES) permits to control toxic pollutant discharges."

That statement is somewhat unreliable and misleading. While it is bureaucratically simpler for regulatory agencies to numerically compare concentrations found in an effluent or in ambient waters with a chemical concentration-based water quality criterion, the claim made in the quoted statement is not necessarily true. In fact, rarely is the exceedance of numeric criteria a reliable basis for assessing the impacts of constituents on human health or the environment. While it may be more precise, it can be highly inaccurate. This is one of the areas that needs to be corrected by the US EPA where biological effects-based approaches are used, rather than chemical-based approaches for regulating such impacts as aquatic life toxicity for potentially toxic constituents.

Page 42162, second column, near the top, does not provide a reliable discussion about how the Priority Pollutant list was developed. It was a court-ordered consent decree that was not internally peer-reviewed by the US EPA, or reviewed by the technical community or the public concerned with these issues. The Priority Pollutant list as promulgated and implemented has proven to be a significant detriment to proper water pollution control efforts in the US since it focuses resources on a number of chemicals that have limited significance to public health and the environment and allows regulatory agencies, dischargers, etc. to ignore the vast arena of hazardous or detrimental chemicals that exist in various types of wastes and point and non-point source stormwater runoff that can and, in some instances, do cause real water quality impacts.

Page 42162, third column, first full paragraph, states,

"Criteria documents, along with any more recent scientific data and information, may be used to interpret a state's narrative criterion pursuant to 40 CFR 122.44(d)(1)(vi), and serve to establish State and EPA permit discharge limits pursuant to CWA section 301(b)(1)(C) which requires NPDES permits to contain limitations required to implement any applicable water quality standard established in the CWA."

This approach is technically invalid since it tends to over-regulate many of the chemical constituents for which water quality criteria exist and ignores the unregulated or under-regulated constituents.

Page 42162, third column, last paragraph, states,

"The forward to that guidance noted EPA's two-fold water quality based approach to controlling toxic pollutants: chemical specific numeric criteria and biological testing in whole effluent or ambient waters to comply with narrative 'no toxics in toxic amounts' standards."

That statement was published in 1983 in the US EPA Water Quality Standards Handbook. While the significant technical deficiencies of this two-fold approach have been known now for over 15 years, the Agency has still not addressed the over-regulation that occurs from trying to use chemical concentration-based criteria to regulate biological impacts associated with aquatic life toxicity and excessive bioaccumulation of hazardous chemicals in aquatic life tissue.

Page 42163, first column, last paragraph, states,

"Congress was frustrated that states were not using the numerous CWA section 304(a) criteria guidance that EPA had and was continuing to develop, to assist states in controlling the discharge of priority toxic pollutants."

The reason the states were not adopting those criteria was that the criteria as implemented tend to over-regulate. The criteria do not properly consider how chemical constituents impact beneficial uses. The US EPA's adjustments of the criteria do not properly incorporate the aqueous

environmental chemistry of the constituents in developing site-specific criteria. Basically, there is still a significant problem with how the US EPA developed criteria relative to how they are implemented at the state and local level. I was involved as a US EPA invited peer-reviewer of the criteria development approach, as well as several criterion documents that became part of the "Gold Book" criteria. I am, therefore, familiar with this topic area and know that it was never the intent of those who helped develop those criteria to have them mechanically implemented, as is being done today, into discharge limits. This leads to significant over-regulation and significant waste of public and private funds in construction of unnecessary treatment works beyond those that would be needed to protect the designated beneficial uses of a waterbody.

One of the fundamental problems that exist today is the US EPA's Independent Applicability Policy. That Policy was adopted without public review in the early 1990s. It establishes that chemical-specific criteria must be met, even if appropriately conducted biological assessments of toxicity, bioaccumulation, etc. show that the chemical-specific criteria are technically invalid for the particular situation of concern. This is a fundamentally flawed approach that should be terminated. This issue has been discussed in a paper, "*Independent Applicability of Chemical and Biological Criteria/Standards and Effluent Toxicity Testing*" (Lee and Jones-Lee, 1995). While the US EPA criteria and standards group in Washington, D.C. has indicated that it is proposing to change the Independent Applicability Policy, the proposed changes as discussed thus far are not adequate to eliminate the fundamentally technically flawed aspects. The purpose of water quality criteria and standards is to protect designated beneficial uses, which for aquatic life means to prevent toxicity as might be measured by the kinds of tests that were used to establish the criteria. It is inappropriate to require achieving chemical-specific criteria as they currently exist, in waters in which there is no toxicity; that Independent Applicability Policy is obviously fundamentally flawed and should not be perpetuated.

Page 42168, first column, first paragraph, states,

"EPA's guidelines are designed to derive criteria that protect aquatic communities by protecting most of the species and their uses most of the time, but not necessarily all of the species all of the time (1985 Guidelines, page 1). EPA's 1985 Guidelines attempt to provide a reasonable and adequate amount of protection with only a small possibility of substantial overprotection or underprotection."

While the statement is appropriate for under-protection for the regulated chemicals, it is inappropriate for over-protection. Many of the water quality criteria tend to grossly over-protect based on the way they are implemented. This applies even to metals implemented as salt species.

Page 42168, first column, first paragraph, the statement, "*The approach EPA is using is believed to be as well balanced as possible, given the state of the science.*" is inappropriate. The US EPA has still not graduated to the level of science that was present as part of the National Academies of Science and Engineering "Blue Book" "Water Quality Criteria" which focused on directly measuring toxicity of chemicals rather than trying to estimate toxicity through chemical-specific

criteria.

Page 42168, third column, first paragraph, states, *"The mercury criteria also differ in this proposal due to the Agency's movement away from aquatic life criteria based on the Final Residue Value (FRV) procedure of the 1985 Guidance."* It has been learned that the proposed CTR's apparent raising of the Hg criterion for protection from excessive bioaccumulation from the current 12 ng/L to 50 ng/L total mercury is only temporary. The regulation of Hg is under review at the national level. The Agency should have indicated to the regulated community in the proposed CTR that the total Hg criterion for prevention of bioaccumulation will likely decrease from the current 12 ng/L set forth in the "Gold Book" to about 5 ng/L. This revised Hg criterion will cause most domestic wastewater discharges to be in violation of this criterion.

Rather than trying to regulate Hg in wastewater effluents and other sources based on the exceedance of the total Hg criterion to prevent excessive Hg bioaccumulation in edible fish tissue, Hg should be regulated based on excessive Hg concentrations in fish tissue. It is technically invalid to assume, as the US EPA has been assuming and proposes to continue to assume, that there is a constant bioconcentration factor that relates the total concentration of Hg in water to excessive Hg concentrations in fish tissue. The actual bioconcentration of total Hg is highly site-specific. To require that all POTWs and other dischargers or sources of Hg have no more than 5 ng/L in the discharge will grossly over-regulate Hg from many sources.

Page 42168, third column, near the bottom, states, *"However, EPA believes that it is appropriate to propose criteria in this rule based on the most recent data."* Following that statement is a table (located on the bottom of page 42168 and top of 42169) in which the proposed freshwater criteria (CMC) for Cr VI is 16 µg/L. That table also lists the CCC for Cr VI as 11 µg/L. I have reviewed the literature on Cr VI toxicity (see attached *"Chromium Speciation: Key to Reliable Control of Chromium Toxicity to Aquatic Life"*) and find that 11 µg/L will not protect zooplankton from toxicity. There is substantial reliable data in the literature which show that Cr VI is toxic to zooplankton at 0.5 µg/L. This situation should have been discussed in the proposed CTR so regulatory agencies, the regulated community and the public learn that an 11 µg/L Cr VI criterion will not prevent zooplankton toxicity and could thereby violate the narrative toxicity standard of no discharge of toxic chemicals in toxic amounts. The CTR should also discuss the fact that in many ambient water systems Cr III (which is allowed to be discharged at 50 µg/L) can convert to Cr VI resulting in concentrations of Cr VI above those that are known to be toxic to zooplankton.

Page 42173, third column, first two paragraphs, discuss the water effects ratio approach for adjusting national criteria. This approach does not adequately or reliably incorporate aquatic chemistry into water quality criteria adjustment. The approach tends to over-regulate because of the failure to equilibrate between the chemical forms in ambient waters and those in the test system. The statement in the third paragraph, *"This approach is technically sound, an efficient use of resources..."* is not appropriate since it leads to over-regulation of chemical constituents in wastewater and stormwater runoff. Enclosed is a summary report *"Regulating Copper in San Francisco Bay: Importance of Appropriate Use of Aquatic Chemistry and Toxicology,"* (1997) on

the over-regulation of Cu in San Francisco Bay that developed due to the inability of the water effects ratio to develop site-specific criteria that properly reflect the toxicity of Cu in San Francisco Bay waters.

Page 42182, second column, first paragraph, uses the term "valence states" for the two forms of Cr. A more appropriate term is "oxidation state" for elements with different numbers of electrons in their outer shell. In chemistry, "valence" as a number has a number of different meanings which are not the same as those used in this context.

Page 42185, second column, first paragraph, discusses effluent trading issues. It is important in effluent trading to properly incorporate aquatic chemistry and toxicology into developing the trade arrangements. This issue is discussed in papers on my web site.

Page 42186, third column, last paragraph and page 42187, first column, first paragraph discuss the application to wet-weather loads. The proposed US EPA criteria will tend to significantly over-regulate wet-weather flows such as urban area and highway stormwater runoff. It is estimated that these costs are on the order of \$1 to \$2 per person per day. This issue is discussed in the attached papers and in other papers on my web site.

Page 42190, bottom of the first and all of the second and third columns, discuss benefits. This discussion on the benefits of achieving these criteria is superficial, at best. There is no way to reliably estimate the improvement in the real water quality - beneficial uses arising from the adoption of these criteria since the database needed to relate the exceedances of the criteria to real water quality use-impairments does not exist. Many of the exceedances that are now occurring are "administrative" exceedances related to overly protective approaches dictated by the US EPA that have been and will likely continue to be used in implementing the criteria into discharge limits.

Comments on Economic Analysis of the Proposed Water Quality Toxics Rule

Page ES-2, second paragraph, "Scope of Economic Analysis," states, *"In addition, EPA does not calculate costs for NPDES sources which are not typically subject to American WQBEL's including sources required to hold NPDES permits stormwater permit and other wet weather dischargers."*

This is a significant deficiency in the cost analysis which makes the CTR largely unreliable. As long as NPDES stormwater dischargers are required to work toward the goal of achieving water quality standards in the receiving waters for stormwater runoff, the cost of achieving these standards must be included in evaluating the potential economic impacts of adopting these criteria. While most NPDES wastewater discharges meet or are close to meeting these criteria at the edge of a mixing zone for the discharge, NPDES-permitted stormwater dischargers in Phase 1 as well as the soon-to-be-released Phase 2 are not yet even beginning to effectively comply with the requirement

of meeting water quality standards in the stormwater runoff during wet-weather runoff events. While it is unknown at this time what the situation will actually be in the future with respect to compliance with water quality standards for NPDES-regulated urban and highway stormwater runoff, until there is a clear, unequivocal policy adopted that exempts urban area and highway stormwater runoff from meeting these criteria, the costs of meeting such standards must be included in a proper evaluation of the cost of implementing these criteria.

National Water Quality Inventory

At the September 17, 1997 hearing on the proposed CTR, the US EPA Region 9 made available on the table in the hearing room a copy of the US EPA Fact Sheet "National Water Quality Inventory: 1994 Report to Congress" (1995) evidently to try to convince the hearing participants that the adoption of the proposed CTR criteria was necessary to protect the Nation's waters from the impact of toxics that are regulated by the proposed CTR. Shortly after the release of that report to Congress, I conducted a review of the procedures used by the US EPA and the states in determining the presence of so-called "impaired" waters and found that the Agency had again used unreliable procedures for designating impaired waters. Enclosed is a copy of a report, *"Unreliable Reporting of Water Quality Impairment by the US EPA's National Water Quality Inventory,"* Feb (1996) that I have prepared on this issue. The Agency dictates to the states that they must list as impaired any waterbody for which there is an exceedance of a water quality criterion more than once in three years. The Agency ignores the well-known fact that many of the exceedances are administrative, arising from the overly protective nature of the criteria that results from the failure of the criteria and the water effects ratio approach to properly incorporate the aquatic chemistry of the regulated constituents into assessing potential toxicity to aquatic life. The actual amount of real use-impaired waters of concern to the public is far less than that predicted by the US EPA "Fact Sheet."

List of Enclosures

Lee, G.F. and Jones-Lee, A., "Independent Applicability of Chemical and Biological Criteria/Standards and Effluent Toxicity Testing," *The National Environmental Journal*, 5(1):60-63, (1995), Part II, "An Alternative Approach," 5(2):66-67 (1995).

Lee, G.F. and Jones-Lee, A., "Appropriate Use of Numeric Chemical Water Quality Criteria," *Health and Ecological Risk Assessment*, 1:5-11 (1995). Letter to the Editor, Supplemental Discussion, 2:233-234 (1996).

Lee, G. F. and Jones-Lee, A., "Unreliable Reporting of Water Quality Impairment by the US EPA's National Water Quality Inventory," Report of G. Fred Lee and Associates El Macero, CA, Feb (1996).

Lee, G.F. and Jones-Lee, A., "Regulating Copper in San Francisco Bay: Importance of Appropriate Use of Aquatic Chemistry and Toxicology," Presented at Fourth International Conference on the Biogeochemistry of Trace Elements, Berkeley, CA, June (1997).

Lee, G.F. and Jones-Lee, A., "Chromium Speciation: Key to Reliable Control of Chromium Toxicity to Aquatic Life," Presented as poster session at American Chemical Society national meeting, San Francisco, CA, April (1997).

Lee, G.F. and Jones-Lee, A., "Diazinon and Chlorpyrifos as Urban Stormwater Runoff Associated Pollutants," June (1997)

Summary Information on G. Fred Lee and Anne Jones-Lee

"Water Quality and Solid & Hazardous Waste Landfills Evaluation and Management"

"Information on the Consulting Activities of Drs. G. Fred Lee and Anne Jones-Lee"